WHAT IS CLAIMED IS:

1.   A modulation method comprising the steps of:

generating a final 15-bit output code word in response to

5   every 8-bit input code word by referring to a set of encoding tables,

wherein the encoding tables contain output code words assigned to

input code words, and contain state information accompanying each

output code word, wherein the state information designates an

encoding table among the encoding tables which is used next to

10   generate an output code word immediately following the output

code word accompanied with the state information in a manner

such that a resultant succession of the output code words follows

predetermined run length limiting rules, and wherein NRZI

conversion results of output code words in first specified one of the

15   encoding tables which are assigned to prescribed input code words

are opposite in polarity to NRZI conversion results of output code

words in second specified one of the encoding tables which are

assigned to the prescribed input code words;

generating a first candidate current output code word in

20   response to a current input code word equal to one of the

prescribed input code words by referring to the first specified one

of the encoding tables;

generating a second candidate current output code word in

response to the current input code word equal to said one of the

25   prescribed input code words by referring to the second specified

one of the encoding tables;

calculating a first DSV from the first candidate current output code word and previous final output code words;

calculating a second DSV from the second candidate current output code word and previous final output code words;

5 determining which of an absolute value of the first DSV and an absolute value of the second DSV is smaller;

selecting one from the first and second candidate current output code words which corresponds to the smaller DSV absolute value as a final current output code word; and

10 superimposing auxiliary information on a sequence of final output code words;

wherein the predetermined run length limiting rules causes a minimum run length in a result of NRZI conversion of the sequence of the final output code words except a sync signal to be equal to 3T,

15 and causes a maximum run length therein to be equal to 14T or less, where T denotes a channel bit period related to the final output code words.

2. A modulation method as recited in claim 1, further

20 comprising the step of selectively setting the maximum run length to either 11T or 14T.

3. A modulation method as recited in claim 1, wherein the superimposing step comprises changing the predetermined run

25 length limiting rules to change the maximum run length in response to the auxiliary information.

4.   A modulation method as recited in claim 1, wherein the auxiliary information comprises a sequence of unit blocks each having a predetermined number of bits.

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5.   A modulation apparatus for modulating input code words in the modulation method in claim 1.

6.   A demodulation method of demodulating a sequence of code

10   words which is generated by the modulation method in claim 1, the demodulation method comprising the steps of:

recovering encoding-state information from the code-word sequence, the encoding-state information representing which of encoding tables has been used in generating a code word

15   immediately following a code word of interest;

demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated encoding-state information; and

reproducing auxiliary information from the code-word

20   sequence.

7.   A demodulation apparatus for demodulating a sequence of code words which is generated by the modulation method in claim 1, the demodulation apparatus comprising:

25   means for recovering encoding-state information from the code-word sequence, the encoding-state information representing

which of encoding tables has been used in generating a code word immediately following a code word of interest;

means for demodulating the code word of interest into an original code word by referring to an encoding table in response to

5   the generated encoding-state information; and

means for reproducing auxiliary information from the code-word sequence.

8.   A recording medium storing a sequence of code words which

10   is generated by the modulation method in claim 1.

9.   A recording medium storing a sequence of code words which is generated by the modulation apparatus in claim 5.

15   10.   A transmission apparatus for transmitting a sequence of code words which is generated by the modulation method in claim 1.

11.   A transmission apparatus for transmitting a sequence of code words which is generated by the modulation apparatus in claim 5.

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12.   A transmission method of transmitting a sequence of code words which is generated by the modulation method in claim 1.

13.   A transmission method of transmitting a sequence of code

25   words which is generated by the modulation apparatus in claim 5.

14.   A method of recording auxiliary information, comprising the steps of:

generating a final 15-bit output code word in response to every 8-bit input code word by referring to a set of encoding tables,

5   wherein the encoding tables contain output code words assigned to input code words, and contain state information accompanying each output code word, wherein the state information designates an encoding table among the encoding tables which is used next to generate an output code word immediately following the output

10   code word accompanied with the state information in a manner such that a resultant succession of the output code words follows predetermined run length limiting rules, and wherein NRZI conversion results of output code words in first specified one of the encoding tables which are assigned to prescribed input code words

15   are opposite in polarity to NRZI conversion results of output code words in second specified one of the encoding tables which are assigned to the prescribed input code words;

generating a first candidate current output code word in response to a current input code word equal to one of the

20   prescribed input code words by referring to the first specified one of the encoding tables;

generating a second candidate current output code word in response to the current input code word equal to said one of the prescribed input code words by referring to the second specified

25   one of the encoding tables;

calculating a first DSV from the first candidate current output

code word and previous final output code words;

calculating a second DSV from the second candidate current output code word and previous final output code words;

determining which of an absolute value of the first DSV and an

5   absolute value of the second DSV is smaller;

selecting one from the first and second candidate current output code words which corresponds to the smaller DSV absolute value as a final current output code word; and

superimposing auxiliary information on a sequence of final

10   output code words;

wherein the auxiliary information contains at least one of 1) an information piece about an encryption key, 2) an information piece being a base of an encryption key, 3) a designating information piece for identifying an encryption key, 4) a designating information piece

15   for identifying a base of an encryption key, 5) an information piece about a region or regions corresponding to one or more countries, one or more zones, or one or more spaces, 6) an information piece about identification of an individual, 7) an information piece about identification of a group of persons, 8) an information piece about a

20   rating, 9) an information piece about identification of an apparatus maker or a device maker, 10) an information piece about identification of a contents provider, 11) an information piece about time, 12) an information piece about contents authors, 13) an information piece about identification of a reproducing apparatus or

25   a reproducing device, 14) an information piece about identification of a connection apparatus or a connection device, 15) an

information piece about identification of a medium on which contents information is recorded, 16) an information piece about identification of contents information, 17) an information piece about accounting, 18) an information piece about playback control,

5   19) an information piece about an address to be accessed, 20) an information piece about recording control, 21) an information piece about a URL address related to contents information, 22) an information piece representing characters, 23) an information piece representing an auxiliary picture, 24) an information piece about

10   audio, 25) an information piece about a copyright, and 26) an information piece about legitimacy of a recording medium storing data.

15.   A method as recited in claim 14, wherein the predetermined

15   run length limiting rules causes a minimum run length in a result of NRZI conversion of the sequence of the final output code words except a sync signal to be equal to 3T, and causes a maximum run length therein to be equal to 14T or less, where T denotes a channel bit period related to the final output code words, and

20   further comprising the step of selectively setting the maximum run length to either 11T or 14T.

16.   A method as recited in claim 14, wherein the superimposing step comprises changing the predetermined run length limiting

25   rules to change the maximum run length in response to the auxiliary information.

17.   A modulation method as recited in claim 14, wherein the auxiliary information comprises a sequence of unit blocks each having a predetermined number of bits.

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18.   An apparatus for recording auxiliary information, comprising:

means for generating a final 15-bit output code word in response to every 8-bit input code word by referring to a set of encoding tables, wherein the encoding tables contain output code

10   words assigned to input code words, and contain state information accompanying each output code word, wherein the state information designates an encoding table among the encoding tables which is used next to generate an output code word immediately following the output code word accompanied with the state

15   information in a manner such that a resultant succession of the output code words follows predetermined run length limiting rules, and wherein NRZI conversion results of output code words in first specified one of the encoding tables which are assigned to prescribed input code words are opposite in polarity to NRZI

20   conversion results of output code words in second specified one of the encoding tables which are assigned to the prescribed input code words;

means for generating a first candidate current output code word in response to a current input code word equal to one of the

25   prescribed input code words by referring to the first specified one of the encoding tables;

means for generating a second candidate current output code word in response to the current input code word equal to said one of the prescribed input code words by referring to the second specified one of the encoding tables;

5   means for calculating a first DSV from the first candidate current output code word and previous final output code words;

means for calculating a second DSV from the second candidate current output code word and previous final output code words;

10   means for determining which of an absolute value of the first DSV and an absolute value of the second DSV is smaller;

means for selecting one from the first and second candidate current output code words which corresponds to the smaller DSV absolute value as a final current output code word; and

15   means for superimposing auxiliary information on a sequence of final output code words;

wherein the auxiliary information contains at least one of 1) an information piece about an encryption key, 2) an information piece being a base of an encryption key, 3) a designating information piece for identifying an encryption key, 4) a designating information piece

20   for identifying a base of an encryption key, 5) an information piece about a region or regions corresponding to one or more countries, one or more zones, or one or more spaces, 6) an information piece about identification of an individual, 7) an information piece about

25   identification of a group of persons, 8) an information piece about a rating, 9) an information piece about identification of an apparatus

maker or a device maker, 10) an information piece about identification of a contents provider, 11) an information piece about time, 12) an information piece about contents authors, 13) an information piece about identification of a reproducing apparatus or a reproducing device, 14) an information piece about identification of a connection apparatus or a connection device, 15) an information piece about identification of a medium on which contents information is recorded, 16) an information piece about identification of contents information, 17) an information piece about accounting, 18) an information piece about playback control, 19) an information piece about an address to be accessed, 20) an information piece about recording control, 21) an information piece about a URL address related to contents information, 22) an information piece representing characters, 23) an information piece representing an auxiliary picture, 24) an information piece about audio, 25) an information piece about a copyright, and 26) an information piece about legitimacy of a recording medium storing data.

19.   An apparatus as recited in claim 18, wherein the predetermined run length limiting rules causes a minimum run length in a result of NRZI conversion of the sequence of the final output code words except a sync signal to be equal to 3T, and causes a maximum run length therein to be equal to 14T or less, where T denotes a channel bit period related to the final output code words, and further comprising means for selectively setting the maximum

run length to either 11T or 14T.

20. An apparatus as recited in claim 18, wherein the superimposing means comprises means for changing the predetermined run length limiting rules to change the maximum run length in response to the auxiliary information.

21. An apparatus as recited in claim 18, wherein the auxiliary information comprises a sequence of unit blocks each having a predetermined number of bits.

22. A method of reproducing an auxiliary information from a sequence of code words which is generated by the method in claim 14, the reproducing method comprising the steps of:

recovering encoding-state information from the code-word sequence, the encoding-state information representing which of encoding tables has been used in generating a code word immediately following a code word of interest;

demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated encoding-state information; and

reproducing auxiliary information from the code-word sequence.

23. An apparatus for reproducing an auxiliary information from a sequence of code words which is generated by the apparatus in

claim 18, the reproducing apparatus comprising:

means for recovering encoding-state information from the code-word sequence, the encoding-state information representing which of encoding tables has been used in generating a code word

5 immediately following a code word of interest;

means for demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated encoding-state information; and

means for reproducing auxiliary information from the code-

10 word sequence.

24. A recording medium storing a sequence of code words which is generated by the method in claim 14.

15 25. A transmission apparatus for transmitting a sequence of code words which is generated by the apparatus in claim 18.

26. A transmission method of transmitting a sequence of code words which is generated by the method in claim 14.

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27. A method of reproducing data from a sequence of code words which is generated by the method in claim 14, the reproducing method comprising the steps of:

recovering encoding-state information from the code-word

25 sequence, the encoding-state information representing which of encoding tables has been used in generating a code word

immediately following a code word of interest;

demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated encoding-state information;

5   reproducing auxiliary information from the code-word sequence; and

executing, in response to the reproduced auxiliary information, at least one of 1) generation of an encryption key, 2) identification of an encryption key, 3) identification of a base of an
10   encryption key, 4) control of playback on the basis of a region, 5) control of playback on the basis of a rating, 6) control of recording and playback on the basis of identification information, 7) control of recording and playback on the basis of recording and playback control information, 8) decision about an address to be accessed, 9)
15   access to an URL address related to contents information, 10) playback of character information, 11) playback of an auxiliary-picture information, 12) playback of audio visual information, and 13) authentication as to whether or not a recording medium is legitimate.
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28.   An apparatus for reproducing an auxiliary information from a sequence of code words which is generated by the apparatus in claim 18, the reproducing apparatus comprising:

means for recovering encoding-state information from the
25   code-word sequence, the encoding-state information representing which of encoding tables has been used in generating a code word

immediately following a code word of interest;

means for demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated encoding-state information;

5   means for reproducing auxiliary information from the code-word sequence; and

means for executing, in response to the reproduced auxiliary information, at least one of 1) generation of an encryption key, 2) identification of an encryption key, 3) identification of a base of an 10   encryption key, 4) control of playback on the basis of a region, 5) control of playback on the basis of a rating, 6) control of recording and playback on the basis of identification information, 7) control of recording and playback on the basis of recording and playback control information, 8) decision about an address to be accessed, 9) 15   access to an URL address related to contents information, 10) playback of character information, 11) playback of an auxiliary-picture information, 12) playback of audio visual information, and 13) authentication as to whether or not a recording medium is legitimate.

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29.   A modulation apparatus comprising:

means for generating a final 15-bit output code word in response to every 8-bit input code word by referring to a set of encoding tables, wherein the encoding tables contain output code 25   words assigned to input code words, and contain state information accompanying each output code word, wherein the state

information designates an encoding table among the encoding tables which is used next to generate an output code word immediately following the output code word accompanied with the state information;

5   means for generating a first candidate current output code word in response to a current input code word equal to one of prescribed input code words by referring to one of first and second specified encoding tables among the encoding tables which is designated by state information accompanying an immediately-

10   preceding final output code word;

means for generating a second candidate current output code word in response to the current input code word equal to said one of the prescribed input code words by referring to the other of the first and second specified encoding tables under conditions where a

15   succession of the second candidate current output code word and the immediately-preceding final output code word follows a run length limiting rule;

means for calculating a first DSV from the first candidate current output code word and previous final output code words;

20   means for calculating a second DSV from the second candidate current output code word and previous final output code words;

means for determining which of an absolute value of the first DSV and an absolute value of the second DSV is smaller;

25   means for selecting one from the first and second candidate current output code words which corresponds to the smaller DSV

absolute value as a final current output code word; and

means for changing the run length limiting rule to change a
maximum run length in a sequence of final output code words in
response to auxiliary information to superimpose the auxiliary

5   information on the sequence of the final output code words.

30.   A modulation apparatus as recited in claim 29, wherein the
sequence of the final output code words represents encryption-
resultant main information, and the auxiliary information contains

10   an information piece for decrypting the encryption-resultant main
information.

31.   A modulation apparatus as recited in claim 29, wherein the
sequence of the final output code words represents scrambling-

15   resultant main information, and the auxiliary information contains
an information piece for descrambling the scrambling-resultant
main information.

32.   A modulation method comprising the steps of:

20   generating a final 15-bit output code word in response to
every 8-bit input code word by referring to a set of encoding tables,
wherein the encoding tables contain output code words assigned to
input code words, and contain state information accompanying each
output code word, wherein the state information designates an

25   encoding table among the encoding tables which is used next to
generate an output code word immediately following the output

code word accompanied with the state information;

generating a first candidate current output code word in response to a current input code word equal to one of prescribed input code words by referring to one of first and second specified

5   encoding tables among the encoding tables which is designated by state information accompanying an immediately-preceding final output code word;

generating a second candidate current output code word in response to the current input code word equal to said one of the

10   prescribed input code words by referring to the other of the first and second specified encoding tables under conditions where a succession of the second candidate current output code word and the immediately-preceding final output code word follows a run length limiting rule;

15   calculating a first DSV from the first candidate current output code word and previous final output code words;

calculating a second DSV from the second candidate current output code word and previous final output code words;

determining which of an absolute value of the first DSV and an

20   absolute value of the second DSV is smaller;

selecting one from the first and second candidate current output code words which corresponds to the smaller DSV absolute value as a final current output code word; and

changing the run length limiting rule to change a maximum

25   run length in a sequence of final output code words in response to auxiliary information to superimpose the auxiliary information on

the sequence of the final output code words.

33.   A modulation method as recited in claim 32, wherein the
sequence of the final output code words represents encryption-
5   resultant main information, and the auxiliary information contains
an information piece for decrypting the encryption-resultant main
information.

34.   A modulation method as recited in claim 32, wherein the
10   sequence of the final output code words represents scrambling-
resultant main information, and the auxiliary information contains
an information piece for descrambling the scrambling-resultant
main information.

15   35.   A demodulation apparatus comprising:
        means for recovering state information from a sequence of
code words, the state information representing which of encoding
tables has been used in generating a code word immediately
following every code word of interest;
20   means for demodulating the code word of interest into an
original code word by referring to a decoding table in response to
the generated state information;
        means for detecting a frequency of occurrence of a specified
run length in the sequence of code words; and
25   means for reproducing auxiliary information from the
sequence of code words in response to the detected occurrence

frequency.

36.   A demodulation apparatus as recited in claim 35, further comprising means for decrypting encryption-resultant main
5   information represented by a sequence of original code words in response to the reproduced auxiliary information.

37.   A demodulation apparatus as recited in claim 35, further comprising means for descrambling scrambling-resultant main
10   information represented by a sequence of original code words in response to the reproduced auxiliary information.

38.   A demodulation method comprising the steps of:

recovering state information from a sequence of code words,
15   the state information representing which of encoding tables has been used in generating a code word immediately following every code word of interest;

demodulating the code word of interest into an original code word by referring to a decoding table in response to the generated
20   state information;

detecting a frequency of occurrence of a specified run length in the sequence of code words; and

reproducing auxiliary information from the sequence of code words in response to the detected occurrence frequency.

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39.   A demodulation method as recited in claim 38, further

comprising the step of decrypting encryption-resultant main information represented by a sequence of original code words in response to the reproduced auxiliary information.

5   40.   A demodulation method as recited in claim 38, further comprising the step of descrambling scrambling-resultant main information represented by a sequence of original code words in response to the reproduced auxiliary information.